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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/697,597	10/29/2003	Michael S. Lockard	P-US082-A-MF	7857

32107 7590 05/27/2008

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EXAMINER

BAREFORD, KATHERINE A

ART UNIT	PAPER NUMBER
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1792

MAIL DATE	DELIVERY MODE
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05/27/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/697,597	Applicant(s) LOCKARD ET AL.	
	Examiner Katherine A. Bareford	Art Unit 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 14 May 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,3,5 and 23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,3,5 and 23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 14, 2008 has been entered.

The amendment filed with the RCE submission of May 14, 2008 has been received and entered. With the entry of the amendment, claims 2, 4, 6-22 and 24-28 are canceled, and claims 1, 3, 5 and 23 are pending for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. The rejection of claims 27 and 28 under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement is withdrawn due to the amendment of May 14, 2008 canceling the claims.

4. Claims 1, 3 and 23 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

In independent claim 1, part (b) (3) is now provided in the amendment of May 14, 2008 that requires “infiltrating a third material into at least a portion of pores in the second material, wherein the third material comprises a metal”. While previous claim 4 provided “infiltrating a third material into at least a portion of pores in the second material”, it did not provide that the third material could or would be a metal. Furthermore, the disclosure as filed also does not provide such a teaching. The only mention of infiltrating a metal, see paragraph [76] of the specification is in regard to an embodiment where a powder material is provided (using a slurry, not thermal spraying) and then infiltrated with molten metal in a specific described process. Therefore, there is no support in the disclosure as filed to claim infiltrating the pores of the thermal sprayed layer with a metal, and the claim contains new matter.

The other dependent claims do not cure the defects of the claims from which they depend.

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen, et al "EFAB: Batch Production of Functional, Fully-Dense Metal Parts with Micron-Scale Features" Article (hereinafter Cohen Article) (provided with applicant's IDS statement of September 10, 2007) in view of Elarde (US 4532152), Lane (US 3880723) and Thermal Spraying: Practice, Theory, and Application (hereinafter TS).

Claims 5: Cohen Article teaches a process for forming a multilayer three-dimensional structure. See pages 161, 163, 164. A layer comprising a plurality of

material is adhered to the first, previously formed layer on the substrate. See figures 2(d) and 2(e) and page 164 (built up 2 material layers are provided, so after the first 2 material layer is provided, the further layers are formed and adhered over the first layer). The forming and adhering is repeated at least once to build up a three-dimensional structure from a plurality of adhered layers. Figures 2(d)--2(f) and page 164. The forming of at least one of the plurality of adhered layers comprises (1) obtaining a selective pattern of deposition of a first metal material having at least one void by selectively depositing a first material onto a previously formed layer such that at least one void remains. Figures 2(a) – (e) and pages 164 and 165 (material can be copper, for example). The first metal material is deposited by electrodeposition. Page 163-164. Then (2) a second material is deposited into the at least one void by blanket deposition of a second material over the first material. Figures 2(c) – 2(e) and pages 163-165 (the second material can be nickel). After the first and second materials are applied, the entire two material layer is lapped (planarized) to achieve precise thickness and planarity. Figures 2(d) – 2(e) and page 164. After the plurality of two material layers have been formed (Figure 2(e)), the first metal (sacrificial metal) is removed from the plurality of layers to reveal the three-dimensional device. Figure 2(f) and pages 164-165. After the depositing of the second material by blanket deposition, during the forming of at least one layer, a subsequent operation is performed that modifies the second material. Figures 2(d)-2(e) and page 164 (After the first and second materials are applied, the entire two material layer is lapped (planarized) to achieve precise thickness

and planarity, which modifies the second material by removing second material).

Multiple layers of materials are formed. Figure 2(e) and page 164 (at least 6 layers are demonstrated).

Cohen Article teaches all the features of this claim except that the second material is deposited by thermal spraying and providing a subsequent operation that would provide enhanced adhesion to a further applied layer.

However, Elarde teaches that it is well known to use either metal layers formed with thermal (flame spraying is a form of thermal spraying) spraying or metal layers formed with electrodeposition (electroplating) interchangeably when making micron order thickness for electronic circuit boards for example. See column 1, line 60 through column 3, line 10, column 4, line 25 through column 5, line 65. The layers can be applied in a blanket fashion over the surface and then planarized to the desired level to fill a channel void. Column 4, line 60 through column 5, line 20, column 5, lines 50-60 and column 6, lines 10-25. The planarizing can occur using a rotating disc that that grinds an abrasive slurry against the coated substrate to smoothly abrade of the surface to a desirable depth over a period of time. Column 6, line 45 through column 7, line 20.

Moreover, Lane teaches that it is well known to perform blanket spraying of a coating material by thermal spraying (plasma spraying is a form of thermal spraying) over a electroformed patterned metal layer with voids to fill the void area. column 2, lines 40-60 and figures 3-4.

TS teaches that before applying a thermal spray coating, it is desirable to improve coating adhesion by cleaning and/or roughening surfaces before thermal spraying. See page 16, sections 3.1 and 3.2 and page 17, section 3.3.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Cohen Article to apply the blanket layer by a thermal spraying process rather than an electrodeposition process as suggested by Elarde and Lane with an expectation of a desirable method of applying a blanket layer, as Cohen Article teaches to form a patterned metal layer containing voids by electrodeposition and to blanket overplate this layer by electrodeposition and then planarizing this blanket layer to fill the voids in the first metal layer, and Elarde teaches that when applying a metal layer by blanket application that will be planarized to fill a void for the electronic application of a circuit board, it is well known to interchangeably use an electrodeposited or thermally sprayed material, and Lane further teaches that it is well known that thermally sprayed material can be blanket deposited over an electroformed, pattern metal layers to fill void areas. As to the subsequent operation to provide enhanced adhesion, it further would have been obvious to modify Cohen Article in view of Elarde and Lane to provide a further cleaning and/or roughening treatment to the complete formed layer before applying a new layer on the formed layer as suggested by TS so as to provide improved adhesion, because Cohen article provides applying further layers, which when performing the void filling steps as suggested by Elarde and Lane would include further thermal spraying material over the previously

formed layer, and TS teaches that when thermal spraying it is well known to provide enhanced adhesion by cleaning and/or roughening the surface to be thermally sprayed before thermal spraying.

8. Claims 1 and 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen Article in view of Elarde, Lane and TS as applied to claim 5 above, and further in view of Severinsson (US 4088046).

Cohen Article in view of Elarde, Lane and TS teaches all the features of these claims except to infiltrate the porous layer of the second material with a third metal material and to planarize the first, second and third materials. Cohen Article provides applying multiple layers, including at least two layers of the plurality of adhered layers as required by claim 23. See Figure 2(e) and page 164 (at least 6 layers are demonstrated). TS teaches that it is known that thermal spray coatings are inherently porous. Page 108, section 8.1.1.

Severinsson teaches that when providing a layer of metal material by thermal spraying, it is known to infiltrate a porous layer of this thermal sprayed material with a further metal. Column 10, lines 44-60 and column 4, lines 5-15. This compensates for shrinkage tendencies. Column 10, lines 55-60.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Cohen Article in view of Elarde, Lane and TS to infiltrate the pores of the thermally sprayed coating with a further metal (third material) as

suggested by Severinsson with an expectation of providing a desirably filled coating that is compensated for shrinkage, because Cohen Article in view of Elarde, Lane and TS teaches application using conventional thermal spray methods of plasma and flame spraying and TS teaches that such thermal sprayed coatings are inherently porous and Severinsson teaches that it is well known to infiltrate porous thermal coated metal layers with further metal to compensate for shrinkage tendencies which would provide for exactly sized application. Furthermore, it would have been obvious to modify Cohen Article in view of Elarde, Lane, TS and Severinsson to provide that the planarizing occurs to the first, second and third materials, because the planarizing in Cohen yields the final, precise thickness and planarity of a complete layer, and a complete layer would have all three materials as suggested by the infiltration of the metal as suggested by Severinsson.

9. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Cohen Article in view of Elarde, Lane, TS and Severinsson as applied to claims 1 and 23 above, and further in view of Amateau, et al "High-Velocity Particle Consolidation Technology", iMAST Quarterly 2000, No. 2, pages 3-6 (hereinafter Amateau Article).

Cohen Article in view of Elarde, Lane, TS and Severinsson teaches all the features of this claim except that the thermal spraying method is a high velocity particle consolidation (HVPC) spraying process.

However, Amateau Article teaches that HVPC is a known thermal spray application method that offers improvements over other conventional thermal spraying methods such as plasma or flame spraying, with HVPC offering lower deposition temperatures eliminating problems associated with recrystallization in both coating and substrates, as well as other benefits. Pages 3-4. The coatings can be applied in patterns with masking. Page 4.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Cohen Article in view of Elarde, Lane, TS and Severinsson to use HVPC as the thermal spraying method to apply the copper and ceramic layers as suggested by Amateau Article with an expectation of providing a desirably improved coating, because Cohen Article in view of Elarde, Lane, TS and Severinsson teaches application using conventional thermal spray methods of plasma and flame spraying and Amateau Article teaches that the thermal spray method of HVPC offers improved benefits over conventional thermal spray methods such as flame or plasma spraying, including offering lower deposition temperatures eliminating problems associated with recrystallization in both coating and substrates.

Response to Arguments

10. Applicant's arguments with respect to claims 1, 3, 5 and 23 have been considered but are moot in view of the new ground(s) of rejection.

The new citation to Severinsson has been provided as to the infiltration of metal.
The new section of TS has been cited as to the improving of adhesion as now required.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:00-3:30) First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on (571) 272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Katherine A. Bareford/
Primary Examiner, Art Unit 1792

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